Our reference: SF20/45633; DOC20/404710-32
Contact : Mr Andrew Helms; (02) 6333 3805

Ms Rose-Anne Hawkeswood
Team Leader
Resources Assessments
Department of Planning, Industry and Environment

Via: Major Projects Planning Portal

19 July 2020

Dear Ms Hawkeswood

BOWDENS SILVER PROJECT – ENVIRONMENTAL IMPACT STATEMENT
State Significant Development 5765

I refer to the Environmental Impact Statement (EIS) prepared for the Bowdens Silver Project SSD-5765 (the proposal) and your request, received via the Major Projects planning portal on 26 May 2020, for the Environment Protection Authority (EPA) to provide advice on the project including recommended conditions.

As requested, the EPA has considered the proposal in terms of the potential impact to air quality, noise emissions, ground and surface water quality. The EPA's response is contained in Attachment A. The EPA recommends that the Department of Planning, Industry and Environment (DPIE) seek further information and clarification from the proponent in respect of the matters raised in Attachment A prior to finalising its assessment of the potential impacts of the Proposal.

Following the receipt of the requested information the EPA would then be able to conclude its assessment of the EIS and provide DPIE with recommended conditions should DPIE consider granting consent for the proposal.

If you have any questions regarding this matter, please contact Mr Andrew Helms at the Regional South (Bathurst) Office of the EPA on (02) 6333 3800 or via e-mail at central.west@epa.nsw.gov.au.

Yours sincerely

[redacted]

SHERIDAN LEDGER
Unit Head
Regional South

Attachment A: EPA comment Bowdens Silver Project EIS – SSD 5765

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ATTACHMENT A:

EPA comment on Bowdens Silver Project (SSD-5765)

The EPA understands that Bowdens Silver Pty Limited proposes to construct and operate a silver, lead and zinc open cut mine approximately 2km northeast of Lue in the Mid-Western Regional Local Government Area. The proposal is comprised of the following major components:

- A main open cut pit and two small satellite pits
- Processing plant
- Waste rock emplacement area
- Tailings storage facility
- Miscellaneous oxide and low-grade ore stockpiles and soil and waste rock stockpiles
- Leachate dam
- Noise barriers
- Water supply pipeline from Ulan/Moolarben Coal mines

The mine would extract and process approximately 2 million tonnes of ore per year over a period of approximately 15 years. Rehabilitation of the mine site would continue for a further 7 years.

The proposed on-site infrastructure will comprise haul roads, water management structures, power/water reticulation, workshops, stores, compounds and offices/amenities as well as re-aligning the existing 500kV Power Transmission Line.

The proposed off-site infrastructure will comprise the relocating of a section of Maloneys Road (including a new railway bridge crossing, a new crossing of Lawsons Creek and a new road intersection at Lue Road) and a 132kV power line.

Development approval for the 132kV power line will be sought separately through an energy provider under Part 5 of the *Environmental Planning and Assessment Act 1979*.

The following sections provide general comments on the adequacy of the EIS and recommendations regarding the provision of additional information to enable the EPA to complete its assessment of the proposal.

1. Air Quality Impacts

Background:

An Air Quality Impact Assessment (AQIA) was prepared for the application and is provided in Part 2 of the EIS. The AQIA presents a meteorological data analysis for the region which is based on data sourced from the closest Bureau of Meteorology (BoM) automatic weather station (AWS) monitoring sites, namely Mudgee Airport AWS, Nullo Mountain AWS, Merriwa (Roscommon) AWS and Bathurst Airport AWS and the two on-site meteorological stations. The selected year for the meteorological modelling is 2017. Upper air data used in the modelling was calculated using TAPM and the computer-based dispersion model known as CALPUFF was used to predict the potential air quality impacts of the project.

Existing air quality conditions were mainly based on recorded data from an air quality monitoring network established by the proponent, which includes:

- Two Tapered Element Oscillating Microbalances (TEOMs)
- Two high volume air samplers (HVAS)
- Twelve dust deposition gauges

Based on the expected operations, the report included 4 modelling scenarios to assess potential impacts of:

- Dust deposition
- Total suspended particulates (TSP)
- PM_{10}
- $PM_{2.5}$
- Nitrogen dioxide (NO_2)
- Hydrogen cyanide
- Metals
- Respirable crystalline silica
- Lead

EPA Assessment:

In assessing the EIS the EPA reviewed the following documentation:

Document	Author/Publisher	Published Date
Bowdens Silver Project EIS: Main Report	R.W.Corkery & Co. Pty Limited (Corkery)	May 2020
Bowdens Silver Project: Part 2: Air Quality Assessment	Ramboll Australia Pty Limited	May 2020
Approved Methods for the Modelling and Assessment of Air Pollutants in NSW 2006 (Approved Methods)	EPA	January 2017

EPA comments:

The AQIA has generally been prepared in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (Approved Methods)*. However, the following matters need to be addressed prior to the EPA providing DPIE with recommended conditions of project consent.

1. Use of non-peer reviewed emission reduction factors

Table A4-3 of the AQIA presents a summary of the proposed emissions mitigation measures to be implemented for the proposed activities. Some of these controls have been applied as a reduction factor (see table below) in the calculation of the emissions inventories for each scenario.

Control	Emission reduction factor (%)	Reference stated in the AQIA
Surface watering for hauling operations	**90**	Australian Coal Association Research Program (ACARP) project C20023 (Cox & Laing, 2014)
Surface stabilisation	**95-99**	NSW Coal Mining Benchmarking Study: International Best Practice Measures to prevent and/or Minimise Emissions of Particulate Matter from Coal Mining, Katestone Environmental Pty Ltd, June 2011
Minimising drop heights	**30**	**No reference is provided.**
Enclosure of dump hopper	**70**	**No reference is provided.**
Water sprays during crushing and screening operations	**50**	**No reference is provided.**

Based on information provided in Table 6.1 in the AQIA, haulage on unsealed roads is identified as one of the most significant emissions sources. Surface watering with a reduction factor of 90% has been adopted as a control for wheel generated dust from hauling activities on unsealed roads. It is stated in the report that this control is based on findings presented in the Australian Coal Association Research Program (ACARP) project C20023. It is the EPA's understanding that ACARP C20023 has not been peer reviewed and these emissions reduction factors are not endorsed under the NPI framework.

Emission reduction factors normally used in air quality impact assessments in NSW for this specific activity are adopted from either of the following sources:

- Emission Estimation Technique Manual for Mining (50% for Level 1 watering and 75% for Level 2 watering); or
- NSW Coal Mining Benchmarking Study: International Best Practice Measures to prevent and/or Minimise Emissions of Particulate Matter from Coal Mining (up to 75% for watering).

Further, it should be noted that the reduction factor for surface rehabilitation (95%-99%) was drawn from the Katestone (2011) report, which referenced an outdated version of the Emission Estimation Technique Manual for Mining. The most recent document version recommends emission reduction factors between 30% - 90% depending on the level of rehabilitation achieved.

Given that some of the adopted reduction factors have not been peer-reviewed or are outdated, the use of these emission reduction factors adds uncertainty to the results and conclusions presented in the assessment.

2. Uncertainty regarding the adequacy of the Best Management Practice determination

Despite the elevated emissions controls adopted in the calculation of the emissions inventories, modelling results presented in the AQIA show large predicted particulate matter increments due to the proposed operations. For instance, modelling predictions for 24-hour average PM_{10} concentrations at the most impacted receptors range between 9 $\mu g/m^3$ and 15.6 $\mu g/m^3$, with the largest predicted impact to occur during Year 9 operations. The largest predicted cumulative impact (predicted project related emissions plus background levels) is 48.1 $\mu g/m^3$ at Receptor R4. Failing to achieve in practice the proposed high levels of emissions control stated in the AQIA will increase the risk of adverse air quality impacts.

Further, it is stated in the report that a Best Management Practice (BMP) determination has been undertaken, however, it is still unclear if all practicable means to minimise air emissions from the premises are being implemented as required under section 128(2) of the *Protection of the Environment Operations Act, 1997*. Identifying all significant controls that could be implemented to reduce potential emissions or any future impacts from the proposed operations (once operational) will help minimise the likelihood of adverse air quality impacts due to the operation.

3. Emissions inventory is not included in the AQIA

Section 9.3 of the Approved Methods specifies that a detailed discussion of the methodology used to calculate the expected pollutant emission rates for each source should be presented as part of the AQIA. The AQIA for the proposed Bowdens Silver Project does not, however, provide a detailed discussion of the methodology used to calculate the emissions inventories for any of the four modelling scenarios. Although Appendix 4 in the AQIA exhibits the formulas used to estimate emissions and some material properties, the emissions inventories are not provided and there is no information regarding other adopted assumptions to estimate the total emissions for each scenario (e.g. distances covered, capacity, intensity rates, controls amongst others). Consequently, there is a lack of clarity regarding the calculated emissions and therefore the results and conclusions presented in the AQIA cannot be verified. Some initial issues identified by the EPA based on the limited information provided are:

a) *Adopted controls*:
   It is unclear how the mitigation measures were incorporated in the calculation of the emissions inventories.

b) *Wind erosion from exposed areas*:
   There is no detailed discussion for the selection of the adopted areas to estimate wind erosion emissions of exposed areas. As such, it is unclear if the adopted wind erosion areas are representative of worst-case emissions.

c) *Estimated emissions for stockpiles*
   Lack of information regarding adopted input variables to confirm estimated wind erosion estimates for these sources. Wind erosion emissions are normally one the largest sources (after hauling and dozer activities). However, stockpile emissions presented in Table 6-1 in the AQIA are estimated to be approximately 2.5%, 5.1%, 8% and 8.5% (for site establishment and construction stage and years 3, 8 and 9 correspondingly) of the total emissions.

d) Haulage distances

Insufficient information to confirm if any of the adopted modelling scenarios is representative of the longest expected haulage distances.

4. Assessment of metals concentrations

Emissions from individual metals were calculated by using estimated Particulate Matter (TSP, PM_{10} and $PM_{2.5}$) emissions and scaling factors based on metals composition for waste rock, ore and soils. However, some assumptions have not been adequately justified and it is unclear if the selected methodology is representative of worst-case expected metals emissions. Specifically:

- It is unclear how the metals composition for waste rock, ore and soils were included in the calculation of the predicted impacts.
- There is no detailed discussion regarding the calculation of results presented in Table 7.7 in the AQIA. Whilst the report states that the metal composition analysis is used to scale the particulate matter (TSP, PM_{10} and $PM_{2.5}$) emission estimates, there is no detailed justification for the selection of this method. It should also be noted that it is unclear why metal concentrations as PM_{10} are less than metal concentrations as $PM_{2.5}$.
- There is no detailed justification to use the median metal concentrations to calculate expected impacts. The report does not include a detailed data distribution to demonstrate that the median concentration is representative of worst-case metal emissions.
- There is no detailed discussion regarding the representativeness of the adopted metal concentrations provided. It is unclear how the adopted metal concentrations compare against the maximum measured metal concentrations.
- There is no information exhibited in the AQIA to show the differences between results from the various metal samples.
- Whilst NSW EPA does not provide air quality criteria for Cobalt, Iron and Lithium, this does not preclude the requirement for these pollutants to be assessed against criteria available by other jurisdictions or appropriate organisations.

5. NO_2 emissions for blasting were not assessed

The AQIA does not assess the potential impacts of gaseous pollutants from blasting activities. Whilst it is stated in the report that these emissions "… *will be managed in accordance with the blast management plan"*, modelling blasting emissions (i.e. particulate matter and gaseous pollutants) can be used to assess the potential impacts of a worst-case blasting scenario as well as to investigate and propose the preferred blasting conditions (e.g. frequency and time during the day to be undertaken).

Requested Information/Actions:

1. Use of non-peer reviewed emission reduction factors

   a) The AQIA needs to be revised to include an additional modelling scenario which adopts alternate emission reduction factors for hauling operations and surface stabilisation from published peer reviewed documents.

2. Uncertainty regarding the adequacy of the Best Management Practice determination

   a) The proponent confirms the viability of the adopted level of controls (i.e. sufficient water is available) to reduce expected emissions.

b) The proponent should confirm whether or not there are any additional practicable mitigation controls or measures that could be implemented to minimise air emissions or reduce any future impacts once operational.

3. Emissions inventory is not included in the AQIA

The EPA recommends that the AQIA be revised to include a detailed emissions inventory for each modelling scenario and transparently justify all assumed and adopted input variables. Emissions calculations should be checked and confirmed addressing as a minimum the issues a-d raised in the comments section above.

4. Assessment of metals concentrations

The EPA recommends that the proponent:

a) Revises the AQIA to transparently justify assumed and adopted input variables used to calculate expected metals emissions.

b) Revises the AQIA to ensure waste rock, ore and soils composition used for modelling is representative of worst-case metal concentrations.

c) Provides a detailed data distribution analysis to justify the selected metal concentrations for the calculation of expected emissions.

d) Presents the metal sampling reports as well as a summary table showing the sampling location, the number of samples and the minimum, average, median and maximum concentration for each metal for each material type.

e) Revise the AQIA to include the assessment of all expected metal concentrations.

5. NO_2 emissions for blasting were not assessed

a) The EPA recommends that the AQIA is revised to include potential impacts from all expected air pollutants from blasting operations. In addition, modelling should be used to investigate and propose conditions for blasting in order to minimise potential impacts.

2. Noise Emission Impacts

Background:

The EPA has undertaken a review of the potential noise and vibration impacts associated with the proposal as described in the EIS documentation. The following proposed construction and operational activities have been assessed:

- Noise associated with the groundworks and construction of the project (including realignment of 500kV power transmission line);
- Road traffic noise associated with the realigned Maloneys Road;
- Operational noise;
- Road noise associated with mine operations; and
- Blasting associated with mine operations;

EPA Assessment:

In assessing the EIS the EPA reviewed the following documentation:

Document	Author/Publisher	Published Date
Bowdens Silver Project EIS: Main Report	R.W.Corkery & Co. Pty Limited (Corkery)	May 2020
Bowdens Silver Project EIS: Part 1: Noise and Vibration Assessment	SLR Consulting Pty Limited	May 2020

EPA comments:

1. Construction noise assessment

Section 4.1 of the NIA describes the assessment of construction for the project as follows:

"*Bowdens Silver proposes an approximate 18 month site establishment and construction stage for the Project, and the activities undertaken within the first 6 months, namely the off-site road network upgrades and the initial on-site vegetation clearance, earthworks and infrastructure would be considered construction works and therefore assessed in accordance with the requirements of the ICNG. Similarly, the off-site water pipeline would be considered construction works and therefore assessed in accordance with the requirements of the ICNG. Whereas, mining would commence within about Month 7 of the site establishment and construction stage to provide the waste rock to construct the first stage of the TSF embankment and the initial ore for processing. The application of the ICNG is no longer justified and the site establishment and construction on-site works from Month 7 are assessed in accordance with the requirements of the NPfI.*"

The 500 kV transmission line that runs through the site is proposed to be relocated, taking approximately 6 – 10 months coinciding with Year 3 operations at the site. The EPA considers that the works associated with the relocation of the 500 kV Power Transmission Line (PTL) are a construction activity distinct from operational activities. The noise impacts from the relocation works have been appropriately assessed against the more stringent criteria in the NPfI rather than the *Interim Construction Noise Guideline* (ICNG), both separately and cumulatively with Year 3 operational noise. It is proposed that the relocation of the transmission line will occur during the daytime hours only.

The proposed hours of work for the 'site establishment and construction stage' are 7am-6pm Monday to Saturday. Table 1 of the ICNG sets out the recommended standard hours of work for construction

as Monday to Friday 7am to 6pm; Saturday 8am to 1pm; and no work on Sundays or public holidays. Where a quantitative noise assessment is undertaken, a 'noise affected' management level of RBL (background) +10 dB and 'highly noise affected' management level and 75 dB applies during the recommended standard hours of work; and a noise affected management level of RBL + 5 dB applies outside the recommended standard hours of work.

The proposed period of work between 1pm and 6pm on Saturdays is outside the recommended standard hours of work described in the ICNG. The NIA has evaluated noise impacts from work during this period based on the standard hours noise management levels of background + 10 dBA and the Highly Noise Affected Level of 75 dBA rather than background + 5dB as required by the ICNG. As such, there is a potential that the extent of construction noise impacts has not been appropriately assessed for the works proposed outside of the recommended hours of work.

2. Road traffic noise associated with the relocation of Maloneys Road

Maloneys Road is an existing local public road that traverses the proposed open cut pit of the Bowdens Silver Mine. An ancillary component of the project is the relocation of Maloneys Road from Lue Road (west of Lue) to the Mine Site, thereby replacing the existing Maloneys Road. Access to the Mine Site during the early stages of the site establishment and construction stage (approximately the end of Month 6) would be provided by the existing road network, principally using Pyangle Road (from Lue Road) and Maloneys Road. Access to the Mine Site during the latter stages of the site establishment and construction stage (from about Month 7) and the entire operational stage would be via Lue Road, relocated Maloneys Road and the mine access road.

Is it proposed that the section of the relocated Maloneys Road between the tailings storage facility (TSF) and the mine entrance will be used by the mine as a haul road and will also remain as a public road. The relocated Maloneys Road will be closer to sensitive receivers to the west of the mine.

Guidance in the NPfI requires that the noise from haul trucks should be assessed against project noise trigger levels (Section 1.4 of the NPfI); whilst the ICNG states that construction works associated within mining should be assessed against the Industrial Noise Policy (now replaced with the NPfI) (Section 1.2 of the ICNG). However, the NIA has assessed the construction associated with the relocation of the road against the construction noise management levels in the ICNG (i.e. against background + 10 dBA); and the operational aspects of the road (i.e. its use as a haul road) in accordance with the NPfI (i.e. background + 5 dBA).

Tables 11 and 12 of the NIA indicate 234 daily heavy vehicle movements (B-doubles) along the section of the relocated Maloneys Road travelling to and from the mine and the TSF, during both the 'site establishment' and 'throughout the mine life' phases. The note to Table 5 states that six B-double trucks will make two return trips per hour, which equates to 24 movements per hour, or 6 movements every 15 minutes.

3. Operational noise assessment

Mining is proposed to commence within about month 7 of the site establishment and construction stage to provide the waste rock to construct the first stage of the TSF embankment and the initial ore for processing. Modelling of noise impacts from mine operations (reported in Section 5 of the NIA) appears to include reasonable worst-case operational scenarios and a number of management and mitigation measures including (but not limited to):

- Noise attenuated mobile fleet and fixed plant;
- Enclosures to fixed plant where practical;
- Several noise barriers/embankments and maximising topographic shielding; and
- Reduced mining activities during the more sensitive evening and night-time periods.

With regard to the 'lower embankment noise barrier', listed in Table 30 of the NIA, there are no details as to the proposed height to which it will be constructed, during which stage it will be constructed nor how it was modelled. Tables 4 and 5, which describe the site establishment and construction schedule and equipment, do not indicate that this lower embankment noise barrier is to be constructed during this stage; yet the corresponding noise assessment scenario map of Figure A in Annexure 15 shows the lower embankment noise barrier installed.

The maps in Annexure 15 are not consistent with the placement of a 5 metre noise barrier in the waste rock emplacement area:

- Year 3 – the barrier is not shown for daytime and night-time however is shown for the evening scenario.
- Year 8 and Year 10 – the barrier is not shown for daytime however is shown for evening and night-time scenarios.

The predicted noise levels from mine operations (Section 7 of the NIA) under adverse meteorological conditions indicate that for non-project-related residences there will be:

- 6 residences with a 1-2 dBA exceedance of the Project Noise Trigger Levels (PNTLs) derived in accordance with the *Noise Policy for Industry* (NPfI);
- 4 residences with 3-5 dBA exceedance of the PNTLs; and
- 1 residence with greater than 5 dBA exceedance of the PNTLs.

Further mitigation is proposed for these receivers, under the guidance of the *Voluntary Land Acquisition and Mitigation Policy* (VLAMP) administered by the Department of Planning, Industry and Environment. The VLAMP describes the NSW Government's policy for voluntary mitigation and land acquisition to address noise impacts from State Significant mining, petroleum and extractive industry developments. The NSW Government has had long-standing processes in place for land acquisition and mitigation associated with mining developments and these procedures are formalised in the VLAMP, including:

- That industry needs to apply all feasible and reasonable measures to minimise noise impacts;
- When noise impacts are considered appreciable and warrant mitigation measures at the receiver and or land acquisition rights upon request;
- The mitigation measures that need to be offered to affected landowners when impacts are marginal or moderate; and
- Requirements for negotiated agreements between applicants and landowners.

4. Operational road traffic noise assessment

The project traffic flows in Table 59 of the NIA do not appear to match those in Tables 11 and 12. For example, under Scenario 2 (Year 3 operation) Table 59 states there will be project traffic flows of 76 light vehicles and 28 heavy vehicles during the day and 30 light and 8 heavy vehicles at night on the relocated Maloneys Road. Table 12 states that there will be 150 to 190 light vehicles, up to 8 buses, 2 to 12 heavy vehicles and up to 2 oversize vehicles daily on the same road.

The assessment of road traffic noise assumes that the relocated Maloneys Road is a principal haulage route. The EPA notes that the NIA does not specify whether the local authority has designated the relocated Maloneys Road as such.

Road traffic noise along the relocated Maloneys Road has been assessed to the residence nominated as R88. The EPA notes that R88 is located on Lue Road, at the proposed intersection of the relocated Maloneys Road. The traffic flows in Table 59 indicate other traffic along Lue Road,

so it is not clear if the assessment of road traffic noise at R88 is only from the relocated Maloneys Road or if it also includes the Lue Road traffic.

It is not clear if off-site truck movements associated with the relocation of the power transmission line have been included in the traffic noise assessment.

5. Blasting

The blasting impact assessment indicates there may be some exceedances of the criteria in the ANZEC guidelines for blasting.

6. Long term noise monitoring

The NIA states that a minimum of two sites will be selected for long term noise monitoring of the site.

Requested Information/Actions:

1. Construction noise assessment

   a) There are inconsistencies in the tables that need correcting in the NIA:
      - Table 45 - R35 and R36A should be highlighted as exceeding the criteria.
      - Table 47 - R37 is listed in both the 'Negligible' and 'Marginal to Moderate' columns. This needs clarifying or correcting.
      - R46 should be listed in Table 47.

   b) The proponent should provide sufficient justification for scheduling work during the proposed out of hours periods between 1pm to 6pm on Saturdays. If works outside standard hours are necessary, the construction noise impacts should be assessed against the background + 5 dBA criteria and appropriate mitigation measures implemented to minimise impacts during outside standard hours in accordance with the ICNG.

2. Road traffic noise associated with relocated Maloneys Road

   a) The NIA should be revised so that the 'construction' and 'operational' aspects associated with the relocation and subsequent use of Maloneys Road as a haul road (where it is located between the mine entrance and the TSF) is assessed in accordance with the NPfI to ensure that feasible and reasonable mitigation is identified to minimise the impact on the nearest sensitive receivers.

   b) To assess the operational noise impact for receivers located to the west of the relocated Maloneys Road, the NIA should clarify if the B-double truck movements along the relocated Maloneys Road were modelled as a line source with the equivalent truck movements per 15 minutes, or as a point source as shown in Figures A, B and D in Annexure 15.

3. Operational noise assessment

   a) The NIA should be revised to identify when the lower embankment noise barrier (on the WRE) will be installed and how/when it was incorporated into the reported predicted noise levels.

   b) The NIA should be revised to clarify how/when the 5 metre noise barrier in the waste rock emplacement area has been included in the noise modelling scenarios and what corrections (if any) have been applied to the reported predicted noise levels.

4. Operational road traffic noise assessment

a) The NIA needs to clarify how the different traffic flows in Tables 11, 12 and 59 were used in the assessment of road traffic noise impacts from the proposal.

b) The NIA should confirm, as per the guidance in the RNP, that the relocated Maloneys Road has been designated as a principal haulage route by the local authority (Section 2.2.2 of the RNP). Where the local authority has not designated the relocated Maloneys Road as a principal haulage route, then we consider that the criteria that apply to the relocated Maloneys Road should be that of a new local road under the RNP.

c) The NIA should assess the potential road traffic noise impact from all traffic in the vicinity of each receiver, not just from one portion of road. For example, R88, R89 and R90 are potentially impacted by road traffic noise from traffic on Lue Road (east and west directions) as well as the relocated Maloneys Road. Similarly, R38, R39, R40, R46 and R47 are potentially impacted by traffic noise on Lue Road as well as Pyangle Road.

d) The proponent should confirm that the road traffic noise assessment in Section 11 for the Year 3 operational scenario includes truck movements associated with the relocation of the power transmission line.

5. Blasting

It is recommended that the proponent design and manage the Maximum Instantaneous Charge of all blasts to ensure there are no exceedance of the criteria in the ANZEC guidelines at all sensitive receiver locations.

6. Long term noise monitoring

1. Further information should be made available on how these sites will be selected and how it will be demonstrated that the levels measured at these sites will be representative for the sensitive receiver locations. Given the sizable nature of the number of sensitive receiver locations in the vicinity of the proposed mine, the EPA request that the proponent consider grouping receiver locations into suitable noise management groups, with a nominated representative noise monitoring point for each group.

3. Groundwater Impacts

Background:

The EPA's assessment of potential groundwater impacts as a result of the proposed mining activities, as described in the EIS, has focussed primarily on the Tailings Storage Facility.

EPA Assessment:

The EPA reviewed the following EIS documentation to assess the potential impacts on groundwater:

Document	Author/Publisher	Published Date
Bowdens Silver Project EIS: Main Report	R.W.Corkery & Co. Pty Ltd	May 2020
Bowdens Silver Project EIS: Part 5 – Groundwater Impact Assessment	Jacobs Group (Australia) Pty Ltd	May 2020
Bowdens Silver Project EIS: Part 16a – Tailings Storage Facility Preliminary Design	ATC Williams Pty Ltd	May 2020
NSW EPA – Environmental Guidelines: Solid Waste Landfills	NSW EPA	April 2016

EPA comments:

1. Proposed TSF design and potential impacts on groundwater

The proponent has detailed that the lining of the Tailings Storage Facility (TSF) will not fully address the EPA standard for permeability guidelines for tailings facilities of 1,000mm @ 1 x 10^{-9} m/s. The proponent seeks to use in-situ clays with thicknesses of more than 0.5m as the floor liner. The applicant also seeks to import clay where the existing thickness of in-situ clays are less than 0.45m thick. Both scenarios above equate to being 50% less than the required thickness sought by the EPA. Further discussion on the EPA's Tailings Dam Liner Policy is contained within Section 4 (Surface Water Impacts) below.

Preliminary investigations reveal that the in-situ clays across the site are heterogenous, having variable low to medium-high plasticities across the TSF site. Details regarding the clay distribution across the TSF layout have not been provided as a means to interpolate the spatial spread of clay variability within the impoundment area. This restricts the identification of specific areas where the proponent seeks to apply proposed lining methods as outlined. Despite this, the proposal of compacting impermeable clays, where available in-situ, to thicknesses that are lesser than 1,000mm is not considered suitable for the preferred TSF site.

The identified site of the TSF area overlies a shallow bedrock of a fractured nature. This proposed TSF lining method involving scarifying/ripping, moisture conditioning and compacting native clays across a fractured shallow geological profile is not supported by the EPA based from geological investigations presented in the EIS. The host geology and its fractured variability increases the potential for a weakness or high permeability zone to compromise the TSF containment efficacy. For this option to be efficient all variables of risk must be mitigated, as the likelihood of a containment failure increases in relation to variables in the TSF construction. The EPA believes a full depth storage blanket liner, of at least 1,000mm is most suitable across this identified TSF site.

The EPA recognises that the TSF report is a preliminary report and further updates and investigations will be carried out to inform a more thorough detailed TSF design. Further detailed and contained TSF design and dam construction quality information will be required to assess its suitability for the preferred TSF site. The EPA maintains a preference for an engineered impervious seal of at least 1,000mm with a minimum permeability of 1 x 10^{-9} m/s and consideration must be given to multi barrier seepage management. It is recommended the proponent refer to the following during the detailed design of the TSF:

- Australian Government Tailings Management: Leading Practice Sustainable Development Program for the Mining Industry (2016) risk-based approach
- NSW Dams Safety Committee (DSC) declarations and guidelines
- ANCOLD Guidelines on Tailings Dams, ANCOLD (2012)
- NSW EPA Solid Waste and Landfill Guidelines (2015, 2016)
- AS/NZ ISO 31000:2018 Risk Management – Principles and Guidelines (Standards Australia, 2009)

2. Monitoring and assessment of predicted impacts on groundwater

The proponent has an extensive groundwater monitoring network situated around the proposed open pit mine, and an adequate regional monitoring network needed to define baseline conditions within and around the mine area. However, preliminary monitoring coverage around the TSF is limited to 5 bores of varying depths, one of which is within the TSF footprint.

In section 8 of the Groundwater Impact Assessment, the proponent has stated that a combination of existing and proposed monitoring bores will be used for monitoring and mitigation purposes and will be detailed within a Groundwater Management Plan (GMP), prepared prior to the commencement of mining. The additional bores would be installed downgradient of the TSF to monitor for potential seepage. After more detailed investigations of the TSF area, downgradient monitoring bores would be installed for seepage detection and interception measures, between the TSF and sensitive receptors, namely, Lawson Creek and associated alluvials, which flow westwards towards the Cudgegong River.

The proponent has proposed to continue regular monthly water level and quarterly comprehensive water quality monitoring. The EPA is satisfied with the proposed monitoring objectives and seek to have it extended to additional monitoring bores to be drilled prior to commencement of works, if approved. The EPA acknowledges the commitment to a GMP with updated monitoring infrastructure and details but seeks that the proponent have it reviewed and endorsed prior to commencement of construction.

Requested Information/Actions:

1. Proposed TSF design and potential impacts on groundwater

   a) In line with the concerns raised above, the proponent should provide further information regarding the TSF design, liner options and the prevention of seepage to the underlying strata.

4. Surface Water Impacts

Background:

The proposed water management systems include:

- clean water diversions (including upstream Blackmans Gully into Price Creek);
- process water supply (13ML/day) via a 58.5km pipeline from adjacent coal mines;
- leachate management system;
- onsite reverse osmosis plant (14ML/year);
- a 'sewage management system'; and
- various sediment basins and water quality dams (including the Leachate Management dam, Processing Plant Area dams, Waste Rock Emplacement sediment dam, Tailing Storage Facility Embankment sediment dam and Southern Barrier sediment dams).

EPA Assessment:

In assessing the EIS for potential impacts on surface water the EPA reviewed the following documentation:

Document	Author/Publisher	Published Date
Bowdens Silver Project EIS: Main Report	R.W.Corkery & Co. Pty Limited (Corkery)	May 2020
Bowdens Silver Project EIS: Part 6 – Surface Water Assessment	WRM water and Environment Pty Limited	May 2020
Bowdens Silver Project EIS: Part 10 – Aquatic Ecology Assessment	Cardno (NSW/ACT) Pty Limited	May 2020

EPA comments:

1. Contaminated water storages design and operation

Tailings Storage Facility

The thickened tailings slurry would be pumped to the Tailings Storage Facility (TSF). The test work program indicates the tailings are potentially acid forming (PAF). The projects feasibility study found free cyanide (3mg/L) and weak acid dissociable cyanide (7mg/L) within the tailings would be "*substantially lower than the EPA's limit for NSW mines of 30mg/L" (Aquatic Ecology Section 1.2.3.4)*. The EPA is not aware of this limit.

The proposed TSF is designed to contain runoff from a 1 in 100 year 72-hour duration rainfall event with an additional contingency freeboard of 0.5m. However, as the TSF will be constructed in three stages over 16 years, it is unclear how the TSF will be operated to ensure overflows will be prevented throughout the entire project. There has been no indication as to whether clean water diversions are proposed for the TSF.

The TSF would be lined by a compacted clay and bitumen liner on the embankment inner wall and a seepage collection system. The hydraulic conductivity of the embankment liner is unclear. It is also unclear if the floor of the TSF will be lined, however geotechnical investigations indicate the natural geology permeability ranges from 6.9×10^{-6} m/s to 1.6×10^{-10} m/s. This is inconsistent with the EPA's *Tailings Dam Liner Policy* (see below). If an alternative liner system is being proposed

and/or where the natural geology of the site is proposed, a robust hydrogeological investigation and impact assessment must be undertaken to demonstrate the proposed system will prevent the pollution of waters.

EPA's Tailings Dam Liner Policy

The EPA's requirement for liners for TSFs and/or contaminated water storages (CWS) at mines sites is to achieve a hydraulic conductivity of $1x10^{-9}$ m/s or less with a constructed clay liner of at least 1000mm (or a geosynthetic liner providing equivalent or better protection). The TSF and CSW liner systems must be designed, constructed and operated to prevent pollution of waters from seepage of contaminants through the base and side walls. If it can be demonstrated that the tailings pose a low risk to the environment (such as inert tailings and the TSF and/or CWS are in rock with discontinuous fractures) a liner with higher conductivity may be accepted. Where an alternative liner system is proposed and/or where the natural geology of the site is proposed as part of the liner system, a robust hydrogeological investigation and impact assessment must be undertaken to demonstrate the proposed system will prevent the pollution of waters.

Waste Rock Emplacement and Leachate Management Dam

During operations, PAF waste rock that contains insufficient quantities of silver, zinc or lead to justify processing would be placed within the waste rock emplacement (WRE). The WRE would provide long term storage and encapsulation of compacted PAF waste rock in a designed landform that would be developed via a sequence of seven cells. The leachate drainage system would detain leachate within the Leachate Management Dam. The Leachate Management Dam is designed to contain a 100 year, 24 hour rainfall event for the entire WRE catchment. The EPA notes that the proposed sizing of the Leachate Management Dam varies between specialist reports (65ML) and the EIS (80ML). This should be clarified in the Response to Submissions report.

The applicant proposes to delay the capping of cells 1 to 3 of the WRE to facilitate stockpiling of low-grade ore on the surface (EIS Section 4.7.7). Consideration should be given to capping the cells as soon as possible to minimise leachate volumes.

The internal embankment of the WRE and Leachate Management Dam would be lined by a 1.5mm HDPE liner with an undefined permeability. It is unclear whether the floors of the WRE and Leachate Management Dam will also be lined to prevent infiltration to groundwater.

2. Processing Plant Area dams

The 'Processing Plant Area Dams' refer to a group of water storages, including:

- Raw Water Dam (8ML)
- Open Cut Pit Dewatering Pond (1ML)
- Runoff Collection Dams (100ML)
- Turkey Nest Dam (65ML)

The EIS indicates the 'Processing Plant Area dams' receive brine from the onsite reverse osmosis plant, leachate pumped from the WRE and runoff from the Run-of-the Mine (ROM) pad. It is unclear which of these processing plant area dams receive contaminated water, and if so whether they are appropriately lined in consideration of EPA's *Tailing Dam Liner Policy* (see above). It is also unclear whether the ROM pad is lined.

The '*Integrated Water Management System*' (Surface Water Assessment Figure 4.2) indicates that the Processing Plant Area Dams will be used as a secondary priority water source for dust

suppression and wheel wash. The EIS has not demonstrated that the *Processing Plant Area Dams* water quality will be suitable for dust suppression/wheel wash.

3. Sediment and/or water quality dams

The proposal includes stockpiles of Non-Acid Forming (NAF) rock, low grade ore and oxide ore. It is unclear which sediment dams will contain contaminated runoff from these stockpiles and/or NAF earthworks and whether they will be lined and sized appropriately.

Non-Acid Forming Rock Stockpiles, WRE and TSF Embankment Sediment Dams

Approximately 43% of the waste rock is expected to be non-acid forming (NAF). Leachate testing of the NAF waste rock indicates it is potentially acidic and contains elevated concentrations of dissolved minerals. Zinc, cadmium, copper, cobalt, arsenic, nickel and manganese exceeded ANZECC (2000) guidelines for the protection of slightly to moderately disturbed waterways.

Rainfall runoff from the NAF waste rock stockpile would be collected by drainage infrastructure and directed to the '*NAF Waste Rock Stockpile Sediment Dam*' to prevent discharge of sediment laden water (EIS Table 8.2). This runoff would be used for dust suppression or if necessary flocculated and released from site. No further information on this dam is provided such as location, sizing, lining, discharge/reuse plans.

NAF waste rock would also be used for construction activities during the site establishment and construction stage (including the embankments of the TSF, WRE and 'Leachate Management Dam', haul roads, flood bunds and noise barriers). It is unclear whether all runoff from NAF Waste Rock would drain to one of the following sediment dams:

- WRE Sediment Dam
- TSF Embankment Sediment Dam
- Southern Barrier External Embankment Sediment Dams
- Haul Road Sediment Dam

Any sediment dam which receives NAF runoff/leachate should be considered to contain contaminated water unless demonstrated otherwise.

Low grade ore, oxide ore stockpiles Sediment Dams

Low grade ore and oxide ore materials would be stockpiled within two dedicated stockpile areas. Any low grade ore that was stockpiled and not processed at the end of the project would be capped and covered as part of the closure. Runoff from the low grade ore and oxide ore stockpiles would drain to either the Processing Plant Area dams or the Oxide Ore Stockpile dam. Leachate testing indicates that these stockpiles potentially contain elevated concentrations of dissolved metals similar to PAF waste rock.

Any sediment dam which receives low grade ore or oxide ore runoff/leachate should be considered to contain contaminated water unless demonstrated otherwise.

'Uncontaminated' sediment dams

The EIS indicates the sediment dams will be '*sized and operated in accordance with the Blue Book (DECC 2008), Type F sediment basins for a 1 in 20, 72 hours design storm event'* with an additional sediment storage equivalent to 50% of water storage capacity.

The applicant should compare the proposed 1 in 20, 72 hour design storm event to the 90th percentile, 5 day rainfall event recommended to demonstrate the proposal is equivalent to or better than the relevant practices and principles. The EPA notes that in some sections of the EIS, the applicant indicates these sediment basins would be sized for 'Type D' basins, and elsewhere within the report those same dams are 'Type F'.

The applicant's long-term objective is *'to discharge as much water collected within the sediment dams to the downstream environment to assist in maintaining environmental flows*". Discharges would not occur until it was confirmed that runoff water derived from the placed stockpiles is suitable for release. Flocculants would be used as required. If discharges are required, monitoring would be undertaken to check manganese and other metalloid concentrations are '*within EPL limits'*. The applicant has not developed a draft monitoring program or proposed discharge criteria.

The EIS indicates the basins could be enlarged to minimise likelihood of discharge. The Water Balance (Section 5, Annexure A) assumed all basins were enlarged with zero overflows, while the EIS assumed all basins would be in accordance with the minimum 'blue book' requirements to 'assist in maintaining environmental flows'.

The overflow frequency, duration and volumes of water discharged under a range of operating scenarios has not been provided.

In exercising its licencing functions, the EPA must consider practical measures that could be taken to prevent, control, abate or mitigate pollution. Discharge of polluted water should generally only be considered when other options have been shown to not be viable or deliver less satisfactory environmental outcomes overall. Consistent with DEC (2008), consideration should be given to increasing onsite storage capacity to enable greater reuse of water and avoid or minimise discharges. On-site practices such as clean-water diversions and minimising the area of disturbed catchment can also be employed to maximise the water available for downstream uses and values.

4. Water Quality Monitoring Program and Site Specific Guideline Values

The EIS does not address the following SEAR requirements:

- describe the water quality monitoring program including monitoring locations, relevant parameters and sampling frequency;
- include a response management plan to identify appropriate trigger values and criteria and provide appropriate response actions if impacts are identified;
- identify the process to detect any trends in the monitoring data obtained; and
- where the proponent intends to undertake the assessment using site specific water quality trigger values, detail the quality of a reference site that has been selected based on the specific considerations outlined in ANZECC (2000).

The EIS indicates the Water Management Plan (yet to be developed) would provide details of the Water Quality Monitoring Program and Trigger Action Response Plans.

It is unclear whether the applicant intends to develop Site Specific Guideline Values for surface water discharges. For example, the applicant intends to '*selectively place waste rock with low leachate potential at the base of the southern embankment such that any seepage through this material does not leach metals exceeding background concentrations*. The groundwater technical report also suggests '*the large number of exceedances of the ANZ Guidelines within the baseline data indicate that site specific trigger values, reflecting the geological formation influences on groundwater chemistry should be developed for monitoring'*.

If proposed, it is unclear how these 'site specific WQOs' are intended to be used. If the intent is to use these to assess whether water quality is likely to support the environmental values of the waterways (i.e. site-specific guideline values), then they should be derived consistent with ANZG (2018). If the intent is to detect water quality changes resulting from the project, then comparison of upstream and downstream monitoring results is potentially more sensitive to water quality changes.

Where site-specific studies are proposed to tailor the trigger values to reflect local conditions, and the results are to be used for regulatory purposes (e.g. to assess whether a licensed discharge impacts on environmental values), then prior agreement from the EPA on the approach and study design must be obtained. In these circumstances, the EPA will require demonstration of how the investigation is consistent with the methodology in the national Water Quality Guidelines.

The EPA notes that the EIS does not adopt a guideline value for iron and cobalt. The *Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000)* recommends that interim working levels are adopted for some toxicants where no moderate or high reliability guideline value is available. The interim working level for iron is 300µg/L, and 1.4ug/L for cobalt. ANZG (2018) have also recently (July 2020) released a draft moderate reliability default guideline value (DGV) for iron (700 µg/L for 95% species protection).

5. Other issues

Temporary and permanent roads

Approximately 5.2km of Maloney's Road would be relocated, including construction of new intersections, a railway crossing, Lawsons Creek crossing and numerous ephemeral waterways. No erosion and sediment control measures have been provided.

It is unclear if all haul roads have been identified and whether they will be permanent or temporary. For example, the mine site layout figures do not indicate how haul roads would connect to the satellite pits. As the location of access tracks is unknown, it is unclear whether 'clean water' zones are undisturbed or potentially impacted by access roads.

Post Closure Water Management

Following completion of the tailings deposition at the end of the project, the TSF would be rehabilitated with a 'store-and-release' capping layer including waste rock, sub soil and topsoil "*to minimise rainfall runoff infiltrating into the deposited tailings profile*". After decommissioning, the 'store-and-release' capping layers and various seepage management measures would manage seepage from the TSF post mining operations.

Process wastewater and sediment/water quality dam water is reused during the mining process however it is not clear how any remaining water will be managed after mining operations are completed.

The final mine void is predicted to remain a groundwater sink, and groundwater modelling suggests the saline water within the pit will not be able to escape or impact on local water quality. The salt balance indicates that salts would gradually accumulate within the pit lake due to evaporative concentration.

Requested Information/Actions:

1. Contaminated water storages design and operation

It is recommended the proponent:

a) clarifies the storage capacity and overflow frequency of the TSF, WRE, Leachate Management Dam and any other contaminated water storages.

b) confirms lining of the TSF, WRE, Leachate Management Dam, and any other contaminated water storages will be consistent with EPA's Tailings Dam Liner Policy (including but not limited to liner type, permeability and thickness). Where an alternative liner system (or natural geology) is proposed, a robust hydrogeological investigation and impact assessment must be undertaken to demonstrate the proposed system will prevent the pollution of waters.

c) clarifies the operational management of the TSF, including how the design sizing and a minimum freeboard will be maintained throughout the project, including the probability of the TSF being overtopped if the design sizing is not maintained during the whole project.

d) clarifies the proposed sizing of the Leachate Management Dam.

e) considers capping active cells within the WRE as soon as completed to minimise the volume of leachate generated at any given time.

2. Processing Plant Area Dams

It is recommended that the proponent:

a) clarifies which Processing Plant Area Dams are contaminated water storages, including their storage capacity and overflow frequency.

b) confirms the liners (including liner type, permeability, and thickness) of any contaminated water storages will be consistent with the EPA's Tailings Dam Liner Policy.

c) undertakes a water quality characterisation and risk assessment to ensure any reused/recycled water is fit-for purpose.

d) details how brine from the RO plant will be managed.

e)

3. Sediment and/or water quality dams

It is recommended the proponent:

a) confirms all locations that receive NAF rock for either stockpiling or construction (such as haul roads and embankments) will drain to a dam

b) clarifies design specifications of dams collecting contaminated water, including sizing, frequency of overflow, and lining (including liner type, permeability, thickness).

c) demonstrates that the proposed design storm sizing for the sediment dams collecting uncontaminated water are equivalent to or larger than the 90th percentile, 5 day rainfall event;

d) if discharges are to occur from any dam the potential impact of those discharges must be considered consistent with the relevant matters under s45 POEO Act, including:

   i. estimate the expected frequency and volume of discharges.
   ii. characterise the expected quality of each discharge in terms of the typical and maximum concentrations of all pollutants likely to be present at non-trivial levels (including coagulants/flocculants).
   iii. assess the potential impact of each discharge on the environmental values of the receiving waterway consistent with the national Water Quality Guidelines (ANZG, 2018).
   iv. where relevant, identify appropriate measures to mitigate any identified impacts, including but not limited to, for example, increased reuse, flocculants and grassed swales.

e) considers using enlarged basins/dams to minimise or avoid discharges and maximise reuse.

4. Water Quality Monitoring Program and Site Specific Guideline Values

It is recommended the proponent:

a) develops a surface water quality monitoring program including but not limited to:
   i. water quality monitoring locations;
   ii. analyte list and sampling frequency for each monitoring location;
   iii. the sampling method for each location;
   iv. the method of analysis for each analyte (as per Approved Methods for the Sampling and Analysis of Water Pollutants in NSW, 2004) and practical quantitation limit;
   v. a site-specific relationship between TSS and turbidity if triggers are provided in TSS concentrations; and
   vi. timing and frequency information for each sampling regime. Sampling should be carried out with a frequency commensurate with risk and stage of operation (including ongoing monitoring for post closure stages).

b) develops a Trigger Action Response Plan (TARP) (that includes decommissioning and rehabilitation monitoring). The TARP should include contingencies to identify and manage any unpredicted impacts and their consequences to ensure corrective actions are implemented;

c) applies ANZECC (2000) Interim working levels or ANZG (2018) draft DGVs for toxicants where no moderate or high reliability guideline value is available; and

d) if site-specific guideline values are developed, they are to be consistent ANZG 2018. The reference sites should be representative of a slightly disturbed condition.

5. Other issues

It is recommended that the proponent:

a) commits to adopting the practices and principles of Managing Urban Stormwater - Soils and Construction - Volume 2C: Unsealed Roads.